STRUCTURE OF ATOM

Atom: Smallest particles of a substance that can take part in a chemical Reaction.

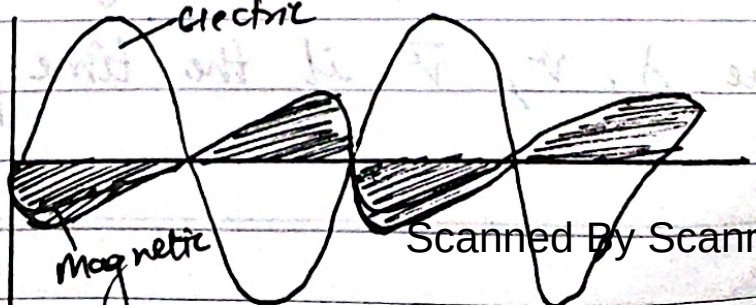
Atoms are made up of proton, neutron & electron
Atomic radii is 10^{-10}m, size of nucleus is 10^{-15}m
All mases of atom is concentrated in nuckus.

Electron	Proton	Neutron.
Negative charge	Positive Charge	Neutral
mass = 9.10939×10^{-31}	1.672×10^{-27}	1.674×10^{-27}
Charge = 1.602×10^{-19}	1.602×10^{-19}	–
Present Outside the nucleus	Inside the nucleus	Inside the nucleus.

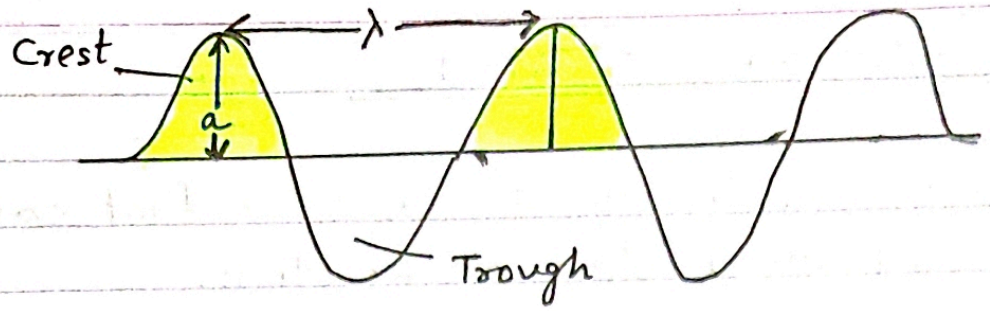
Quarks: Protons & Electrons are made up of various combination of Elementary particles called Quarks. Quarks have fractional charges.

Electromagnetic Radiations.

Those radiations which are associated with electric & Magnetic field are called electromagnetic Radiations. They travel by speed of light. It is denoted by 'c'



Electric & Magne
both are lar to
each other



Wavelength : distance b/w centre of two adjacent crest or trough. It is denoted by λ

Frequency: Number of waves passes through a point in one second. It is denoted by (nu) ν

S.I unit of hertz $\nu = \frac{1}{T}$

$$\nu = \frac{c}{\lambda}$$

where c is velocity of light $(2.9979 \times 10^8 \, ms^{-1})$
$\approx 3 \times 10^8 \, ms^{-1}$

Amplitude: Height of crest or trough. It is denoted by 'a'

Wavenumber: $(\bar{\nu})$ Reciprocal of wavelength

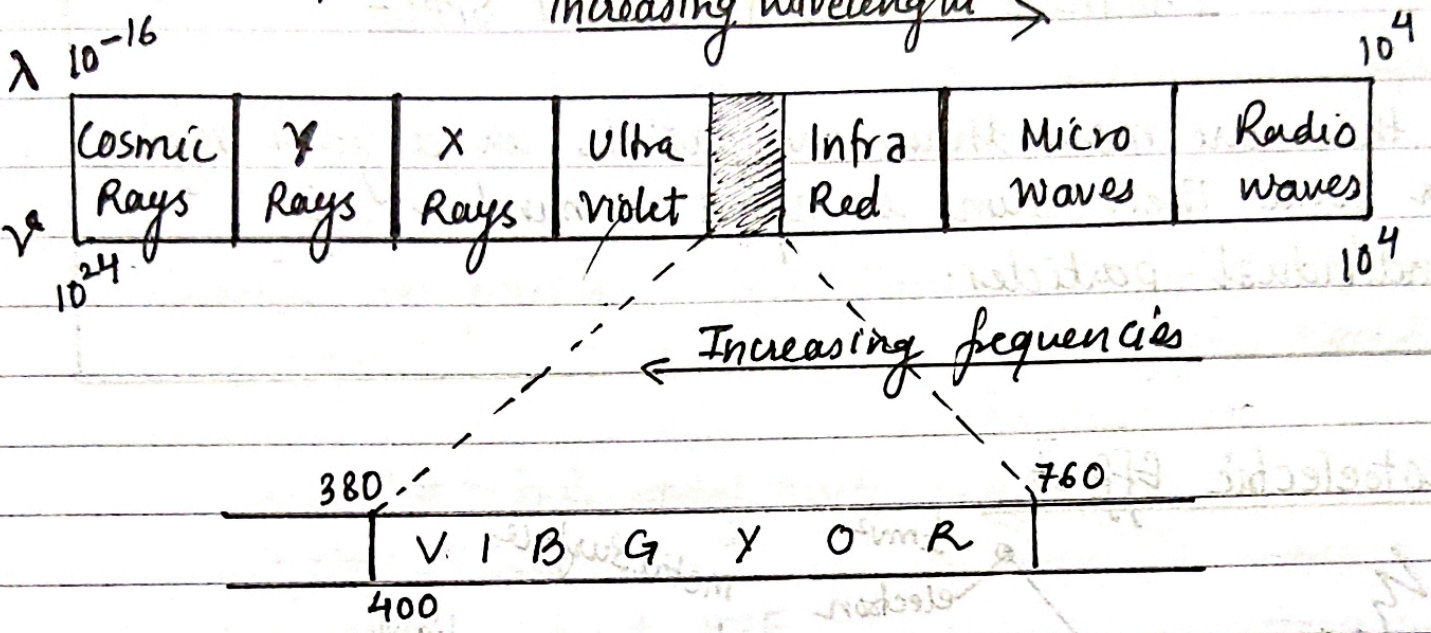
$$\bar{\nu} = \frac{1}{\lambda}$$

Q | Yellow light emitted from a sodium lamp has a wavelength (λ) of 580 nm. Calculate the frequency ν and $\bar{\nu}$ wavenumber of Yellow light.

Q. | Calculate the λ, ν, $\bar{\nu}$ if the time period is 2×10^{-10} s.

Electromagnetic Spectrum:

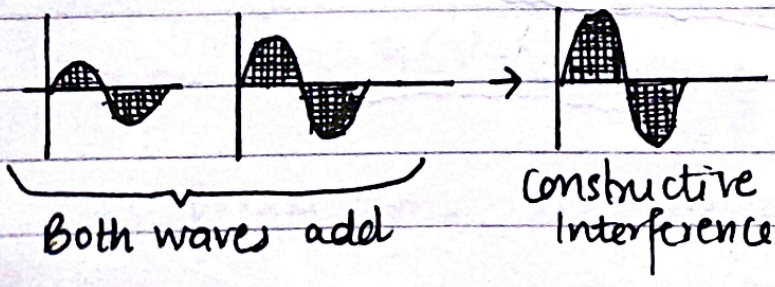
When electromagnetic Radiations are arranged in order of their increasing wavelength or decreasing frequency the complete spectrum obtained is called electromagnetic spectrum.



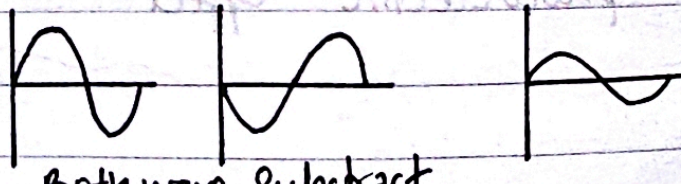
Wave Nature:

A wave is spread out in space. Two or more wave can exist in same region or space. When two waves are present together the resultant wave can be

Larger
Additive Interference
Constructive



Smaller
Substractive Interference
Destructive



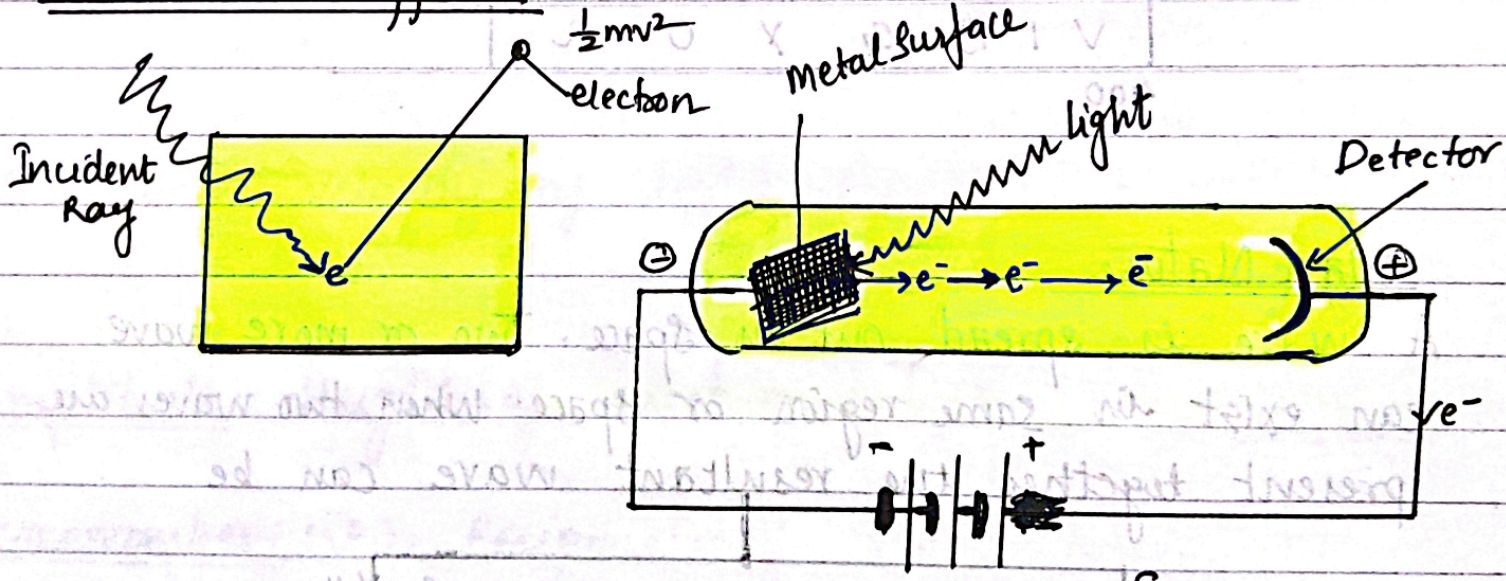
Particle Nature :

A particle occupies a well defined position in space which cannot be simultaneously occupied by another particle i.e.

PARTICLE IS LOCALISED IN SPACE

If there are more than one particle in a given region or space. Their sum is equal to number of individual particles.

Photoelectric Effect



When a radiation with frequency (ν_0) [Threshold frequen strikes a metal surface, the ejection of electron from the surface of metal takes place & this is called photoelectric effect.

In photoelectric effect the number of photoelectron ejected is directly proportional to the intensity of incident light showed that light consist of particle called photons moving with speed of light

Photon strike the electron and photoelectron ejected.

$$E = h\nu$$

Energy of photon = Work Func^n + kinectic energy of Ejected electron.

$$h\nu = h\nu_0 + \frac{1}{2} mv^2$$

$$h\nu = W_0 + K.E$$

where W_0 = work function

ν_0 = Threshold frequency

$$\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + \frac{1}{2} mv^2$$

where λ_0 is threshold wavelength.

$$K.E = (h\nu - h\nu_0) = h(\nu - \nu_0)$$

$$h(\nu - \nu^0) = \frac{1}{2} m_e v^2$$

where m_e is the mass of electron.

Dual behaviour of Electromagnetic Radiations.

From photoelectric effect & interference we concluded that light possesses both particle and wave like properties.

light has dual behaviour.

light either behave as particle or like wave.

	Particle	Wave.
1)	Particle is localised	Wave is delocalised.
2)	Two particles cannot occupy the same position in space.	Two or more waves can exist in the same region in Space.
3)	Two particles do not interfere.	Two waves may interfere constructively or destructively

Atomic Spectra.

Electro magnetic spectrum consist of radiations of different wavelength & frequencies

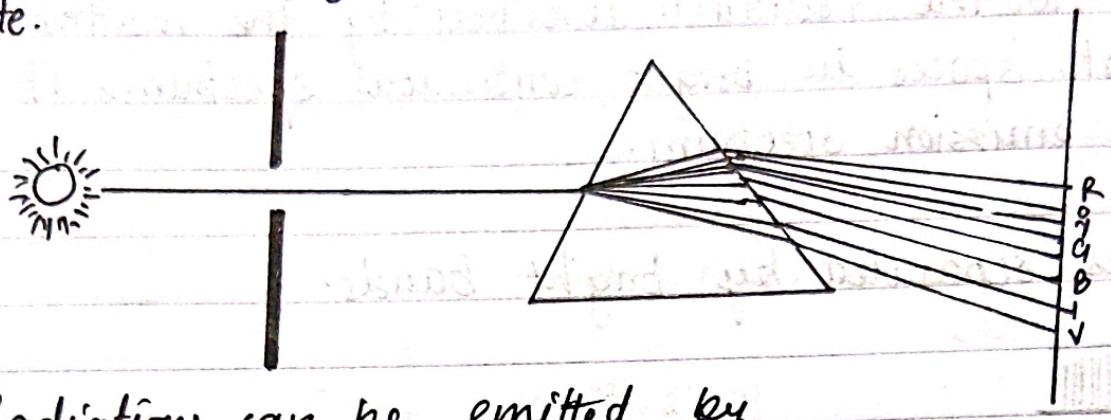
These can be analysed by an instrument called "Spectroscope"

Depending upon the nature of the radiations emitted or absorbed. The spectra broadly classified into two types

- Emission Spectra
  - Continuous Spectra
  - line Spectra
- Absorption Spectra

Emission Spectra:

In Emission spectra, radiations are emitted from source and are passed through prism and obtained on photographic plate.



Radiations can be emitted by

* Sun or glowing bulb
* passing electric discharge through a gas at low pressure.
* By heating a substance to high temperature.

Continuous spectra	line Spectra. (Finger print)
when sunlight is passed through a glass prism, it splits into seven bands of colour. These colour are continuous ∴ known as continuous spectrum	when vapours of some volatile substance allowed to fall on a flame of bunsen burner, then analysed with the help of spectroscope. Specific line appears. eg. In case of Sodium two yellow line corresponding to λ 589nm observed. It is also called Atomic Spectra.

* No two elements resemble with each other in their line spectra ∴ regarded as the finger prints.

Absorption Spectra:

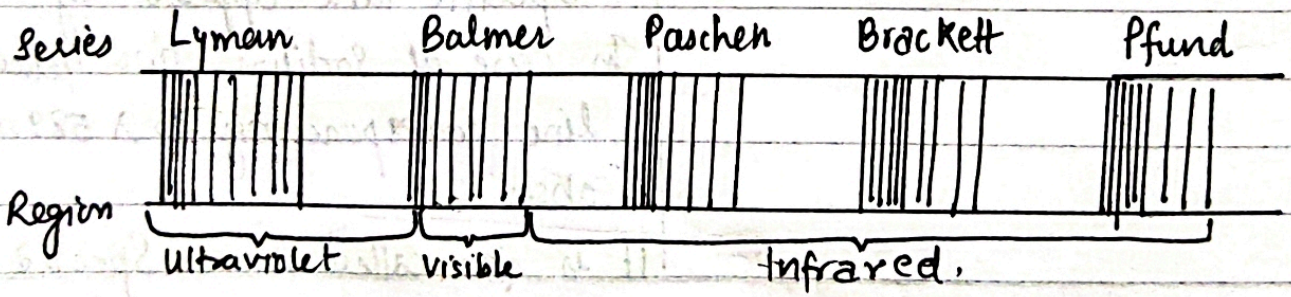
When white light is passed through a sample, it absorb a certain wavelength. The missing wavelength which correspond to the radiation absorbed by the matter leave dark spaces in bright continuous spectrum, it is called emission spectrum.

Dark lines separated by bright bands.

Hydrogen Spectrum:

If a discharge is passed through hydrogen gas at a low pressure, some hydrogen atoms are formed, which emit light in the visible region. This can be studied by spectroscope.

It is found to comprise series of lines of different wavelength. The four lines can be seen by eyes but many more observed photographically in ultraviolet & Infra-red region.



Rydberg in 1890 has given simple theoretical equation for the calculation of wavelength. The equation is known as Rydberg formula (or equation)